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**SECOND SEMESTER 2022-2023**

# Course Handout Part II

Date: 16-01-2023

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

**Course No. : ECE F341 / EEE F341/ INSTR F341**

## **Course Title : Analog Electronics**

## Instructor-in-Charge : Prasant Kumar Pattnaik

Other Instructor : Amit Kumar Panda

## Tutorial Instructors : Prasant Kumar Pattnaik, Amit Kumar Panda, Rajesh Kumar Tripathy and Ponnalagu R.N

Lab Instructors : Prasant Kumar Pattnaik, Rajesh Kumar Tripathy and BVVSN Prabhakar Rao

Research Scholars: Chaluvadi V Nagabhaskar, Vanamathi S, Nischita K, Subhrajyoti Bose, Sohel Siraj

**Scope and Objective of the Course:**

The aim of the course is to deal with various electronic techniques and building blocks used in analog signal processing applications. Discrete and Integrated electronic circuits will be studied. Experiments and projects using opamps and discrete IC modules will be carried out in the laboratory.

Course Outcomes

After learning the course, students will be able to

* Design analog electronic circuits using opamps and discrete components for linear and non-linear signal processing (real time) applications.
* Analyse a given analog integrated circuit and evaluate its performance.
* Convert analog to digital and digital to analog signal of desired accuracy and resolution using data converters
* Design voltage regulators and power supplies using regulator ICs and sinusoidal and non-sinusoidal signal generators using opamaps and timer ICs

**Textbooks:**

1. TB1 L.K. Maheshwari, Analog Electronics, PHI, 2005
2. TB2 L.K. Maheshwari and M.M.S. Anand, Laboratory Experiments & PSPICE Simulation in Analog Electronics Experiments, PHI, 2005.

**Reference books**

1. R1. A.S. Sedra, K.C. Smith, Microelectronic Circuits, 5th Ed., Oxford, 2004.
2. R2. S. Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 3rd Ed. McGraw Hill.
3. R3. Ramakant A. Gayakwad, “Op-Amps and Linear Integrated Circuits”, 4th Ed., 2015, Pearson

**Course Plan:**

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| --- | --- | --- | --- |
| **Lecture No.** | **Learning objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| 1-2 | Key concepts dealing with the basics of circuit theory and electronic devices are reviewed | Introduction & review of concepts | TB1 Ch 1 |
| 3-10 | Introduce the basics of ideal and practical op-amps | Op-amp Basics | Class notes & TB1 Ch 2 |
| 11-14 | Introduce the applications of ideal and practical op-amps in analog electronic systems | Special purpose Op-amp circuits | Class notes and  TB1 Ch 3 |
| 15-21 | This part discusses the important features and practical realization of active filters. Switched-capacitor filters are also included. | Active Filters | Class notes and TB1 Ch 4 |
| 22-27 | Applications of Op-amps in realization of nonlinear functions such as log and antilog amplifiers, multipliers, dividers are included. Precision circuits, comparators, Schmitt trigger, analog switches, sample-and-hold circuits, analog multipliers, etc. are also introduced. | Non-linear Op-amp circuits | Class notes and TB1 Ch 5 |
| 28-31 | Sinusoidal and non-sinusoidal signal generators using op-amps and timer ICs are introduced. This part also introduces phase locked loop along with other integrated circuits. | Signal generators & Phase lock loop | Class notes and TB1 Ch 6 |
| 32-35 | This part discusses the voltage regulators and also the design of power supply using regulator ICs. | Voltage Regulators | Class notes and TB1 Ch 7 |
| 36-40 | This part includes the study of analog-to-digital and digital-to-analog converters. The performance measures and design aspects of data converters will be covered in this part. | Data Converters-D/A, A/D Converters | Class notes and TB1 Ch10 |

Lab Experiments:

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| --- | --- | --- |
| S.No | Experiment | Reference to Text |
| 1 | Common Emitter Amplifier | TB2 Exp 2 |
| 2 | Basic Configuration of Opamp-I | TB2 Exp 5 |
| 3 | Basic Configuration of Opamp-II | TB2 Exp 5 |
| 4 | Characterization of Op-amp | TB2 Exp 6 |
| 5 | Study of Feed Back Amplifiers Using Opamps | TB2 Exp 8 |
| 6 | Instrumentation and Programmable Amplifier | TB2 Exp 7 |
| 7 | Study of Active Filters Using Opamps | TB2 Exp 9 |
| 8 | Precision Circuit | TB2 Exp 12 |
| 9 | Sinusoidal and Non-Sinusoidal Oscillators | TB2 Exp 15 |
| 10 | Integrated Circuit Timer and Phase Locked Loop | TB2 Exp 16, Exp 17 |

**Evaluation Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Component** | **Duration** | **Weightage (%)/ Marks** | **Date & Time** | **Nature of Component** |
| Midsem | 90 minutes | 30 % (60) | 13/03 4.00 - 5.30PM | Closed book |
| Quizzes | To be announced | 10 % (20) | To be announced | Open book |
| Laboratory – Regular lab evaluation | Lab hours | 15 % (30) | Lab hours | Lab experiments /Open book |
| Laboratory Exam (Quiz/Assignment/Expt) | To be announced | 10 % (20) | To be announced | Lab experiments /Open book |
| Comprehensive exam | 180 minutes | 35 % (70) | 09/05 AN | Closed Book |
| TOTAL |  | 100 % (200) |  |  |

**Chamber Consultation Hour:** To be announced in class

**Notices:** Notices concerning the course will be put up on the CMS

**Make-up Policy**: Make-up will be given on genuine grounds only. No makeup for quizzes/ assignments.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity should be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Prof. Prasant Kumar Pattnaik

**INSTRUCTOR-IN-CHARGE**